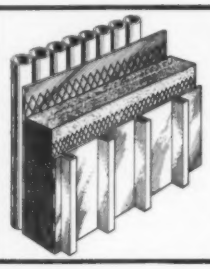
Midwest Engineer

WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

1957-58 WSE PRESIDENT ORMAS G. SMITH

ARE ENGINEERS UNDERPAID?—PAGE THREE

VOL. 22 JUNE, 1957 No. 1



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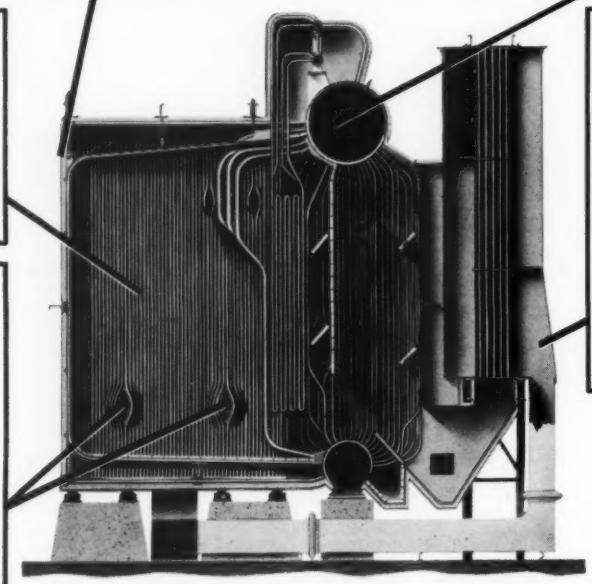

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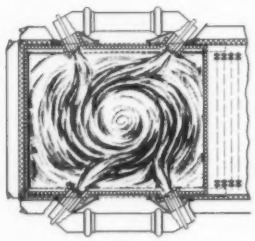

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CONTENTS

Are Engineers Underpaid? 3
Professional Directory 22
ESPS Listings 24
Book Reviews 26
News of Engineers 28
Applications 30
Advertisers' Index 31

COVER STORY

Ormas G. Smith, the new president of the Western Society of Engineers is shown on the front cover this issue. He is chief engineer of the Illinois Bell Telephone Company.

Mr. Smith was graduated from Armour Institute of Technology with a bachelor of science degree in civil engineering in 1923. His first employment was as an engineer in the Bridge and Building Department of the Illinois Central Railroad.

In 1926, he accepted employment as an engineer in the Engineering Department of the Illinois Bell Telephone Company. Since then his positions have been engineer of buildings, equipment and building engineer, and plant extension engineer. On December 6, 1950 he was appointed chief engineer.

Mr. Smith served as chairman of the Communications Committee of the Chicago Civil Defense Organization, and during World War II was head of Civil Defense activities for Illinois Bell. In 1952 he spent nine months in New York and Washington, D.C. serving as chairman of the Communications Panel studying the defense problems of the United States.

In the Western Society Mr. Smith has served as a trustee, as second and as first vice-president. He became a member of the Society in 1935.

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A panel discussion on the rewards of engineering, with a statistical analysis

Are Engineers Underpaid?

The Problem[2]

THIS particular question presents a problem with innumerable facets, and the subject matter should be, "Are Engineering Efforts Adequately Rewarded?"

Having established a broader base for this discussion, we should define the particular group we are considering.

When we speak of an engineer, we are speaking of an individual who has attained, or possesses the faculties to attain, professional status. In engineering, this is related to that level where an individual, because of scientific training and experience, is capable of assuming the responsibility for design of a project. This will help us understand the complexity of this problem, since design is required for a small machine part as well as a large power-plant installation, and the degree of ability and responsibility for these two projects is quite different.

The rate of remuneration for a position will also vary from one company to another, in different parts of the country, and for similar positions in the same locality. These discrepancies are generally dictated by need, since the rate of pay for engineering service is governed by the law of supply and demand, the same as any other commodity.

One Founder Society recently proposed four different methods for evaluating engineering work. They also suggested several variations of the four basic methods, each of which was intended to give a similar answer.

Several years ago one state society recommended a minimum salary of $4,000 per year, with no attempt to specify minimum salaries for successively higher grades of professional service.

Other Rewards

There are, of course, some other rewards for engineering effort. The engineer has attained a moderately comfortable standard of living, and the rewards beyond these physical things cannot be overlooked. Number one is the satisfaction of his job. An engineer is an imaginative person who has the opportunity of expressing his thinking in a concrete manner. Having a pioneer spirit, he derives considerable pleasure from having created, or bettered, some item which benefits mankind.

Reward number two is the engineer's freedom, being generally permitted to devise his own methods and create his own solutions for most of the work he performs with a minimum of restraint on his initiative.

Last, but not least, we should consider the opportunities afforded the engineer for management positions. His mind has been trained to thoroughly analyze a problem, logically select a method of solution, and develop an accurate answer. This type of thinking is extremely valuable to our modern complex business system where management is looking for properly adjusted engineering minds to assume the responsibility of directing our vast industrial system.

Yet the engineers who succeed in reaching these higher levels of success are somewhat in the minority, due to one failing which engineers generally do not avoid. We have been trained both in our schooling and our experience that there is only one answer which gives the best result for any problem. This type of thinking tends to narrow our viewpoint and is not necessarily conducive to good management.

Supply and Demand

Engineering services, as has been stated, are subject to the law of supply and demand. We all know that anything in short supply tends to command a premium price. However, there is a limit to the premium which will be paid for anything regardless of the demand. When the price of any commodity becomes more than the purchaser is willing to pay, the demand begins to diminish, and engineering is finding itself in this position. Today's problems are more complicated than those of a few years back and, in general, the profession is doing a better job than it did fifteen years ago. Both conditions have contributed to the increased cost of engineering but they do not account for the over-all percentage increase during the past fifteen years. We have been prone to excuse engineering inefficiency by the increased difficulty of the problem and the better job we have been doing. But we should not lose sight of the fact that the cost of engineering in terms of percentage of the total cost of the finished plant or product has doubled, and even tripled in some instances.

In general, these points have been management-biased. This emphasis has been purposeful because our best method of improving our financial status is to appreciate the problems governing our present status, and to improve on those things which apparently are the limiting factors. This approach should, in time, obtain results satisfactory to all concerned.

Dan McQuaid, the cowboy engineer, as he classifies himself, has succeeded

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1 Based on three papers sponsored by the National Junior Committee and the Education Committee, and presented at the Fall Meeting, Denver, Colo., Sept. 10-12, 1956, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

2 By J. A. McCormack, Stearns-Roger Manufacturing Company, Denver, Colo.

This article is reprinted from the February, 1957 issue of MECHANICAL ENGINEERING.

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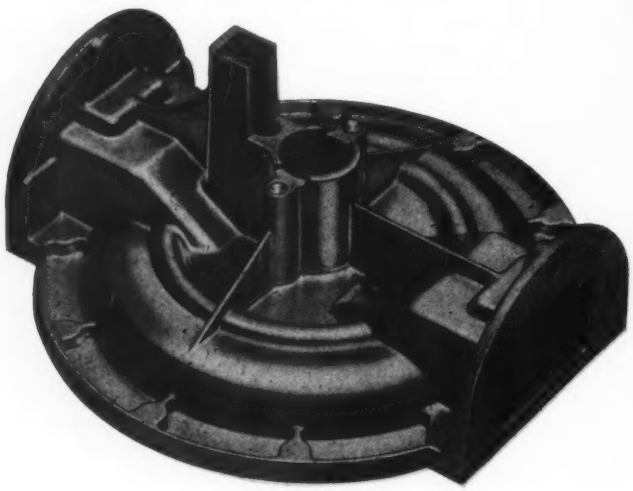

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in equating this problem in true engineering fashion. Any position, engineering or otherwise, can be evaluated by the formula $V = A - S$, i.e., the value of any position is equal to the ability of the individual to produce, minus supervision. By transposing this equation and going back to our original definitions, we find our natural capacity or inventiveness, less the supervision required, establishes the value of the work we do. Increasing the productivity or quality of our engineering effort will result in greater reward.

A Statistical Analysis[3]

THE Engineers Joint Council and the National Society of Professional Engineers each have information that is helpful in consideration of this question, and statistics are available from several other sources. It is important to keep in mind that the various methods used in collecting the data when gathered, the differences in the size of the samples, and other factors will affect a true comparison of the results.

Other Professional Salaries

The median income for several professions is shown in Table 1, while a 1951 survey of the U. S. Dept. of Commerce gave the median income of physicians as $10,528; dentists $6501; and lawyers $6956. A 1954 report of the American Bar Association reports average net income of all lawyers as $7532.

Table 1

Median Income in Selected Professions [a]

Accountants and auditors	$4022
Architects	5580
Chemists	4373
Dentists	6232
Engineers:	
Aeronautical	4851
Civil	4518
Electrical	4690
Mechanical	4633
Other	4834
Lawyers and judges	6257
Physicians and surgeons	8115
Surveyors	2805

[a] Source: 1950 Census, chart on "Professional Employment Statistics."

The American Chemical Society reported in a sampling survey of 1950 income, a median of $3800, five years after BS degree; $6800 after fifteen years; $8300 after twenty-five years; and $9000 after thirty-five years of experience.

A survey by the American Institute of Architects disclosed a 1949 median income for beginning member practitioners of $5400, rising to $14,000 at the age of 62.

Table 2

Engineers' Income by Age Groups [a]

35-39	$ 7300
40-44	8100
45-49	8700
50-54	9300
55-59	10000
60-64	10000
65-69	10200
70-	9300

[a] Source: U. S. Dept. of Labor, Bureau of Labor Statistics, report on "Employment, Education, and Income of Engineers, 1949-50."

In Table 2, engineers' income is shown according to age groups.

[3] By Donald C. Neithercut, American Iron and Steel Works, Denver, Colo.

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In comparing these statistics it is important to remember the difference in employment practice in the different professions. Approximately 35 per cent of the lawyers, 22 per cent of all physicians, and 8 per cent of all dentists are engaged in major salary positions. The architects do not report how many of their men are on salary positions, but they do report that the salary range for private employees started at $5000 at age 28 and ran up to $8000 at age 53. This compares with the range from $5400 to $14,000 for architects in self-employment. Engineers who are self-employed in the consulting business show an income of $10,700 which is $2300 higher than those in private industry. Engineers who are self-employed as the owners of businesses report an income of $14,700. This is $6300 higher than the income received by engineers in private industry. This difference in salaries between persons in private employment and those employed by others exists in nearly all the learned professions.

Also, we must keep in mind the length and type of training required for each of the professions considered. The Council of Dental Education reports that 27 per cent of the men admitted to dental school have four years of college work and 42 per cent have a master's or other advanced degree.

The American Society of Mechanical Engineers, in 1954, conducted a survey of its members asking them to report their income and their age shown in Table 3.

Table 3
Mean Income of ASME Members, 1954

Age	Arith. Mean
-24	$4700
25-26	5400
27-28	6000
29-30	6600
31-32	7000
33-34	7700
35-39	9500
40-44	12100
45-49	14700
50-54	15100
55-65	15900
65-	14900

The arithmetical mean of the whole report is $9500. To compare this report with any of the other figures just reported is difficult, because this a select group and not necessarily representative of all the engineers in the country. This mean compares with an over-all median of $8100 taken from a 1949-1950 survey by eighteen engineering societies of members 35 years of age and over.

Engineers Joint Council in their 1953 report "Professional Income of Engineers" have gathered together information that is more current than other reports and presented in a manner that is of interest to all engineers. If you wish to study this problem further this book will be an excellent source of information. The book contains fifteen graphs showing the earnings of engineers in all branches of industry with the year of entry into the profession. The graphs not only show the median salary but the upper quartile and the lower quartile.

The information in the table showing the earnings of engineers in industry is worthy of consideration. This is a composite of all the other graphs and covers

(Continued on Page 18)

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England's Need: Trained Personnel

The main roadblock to England's ambitious plans for creating a gigantic nuclear power industry within the next twenty years is not a shortage of technical knowledge as has sometimes been suggested, but a scarcity of trained personnel, according to an English engineer speaking in San Francisco on June 10.

Addressing the Semi-Annual Meeting of The American Society of Mechanical Engineers, W. R. Wootton of Babcock & Wilcox Ltd., London, denied that atomic power stations built in Britain today are inefficient and would soon be obsolete, as has been contended by some experts.

Conceding that demand for coal and oil in Britain will soon exceed the available supply, and that this situation calls for rapid development of nuclear power for industrial use, he said that the present British program "is by no means a stopgap adopted by a country with a dire shortage of conventional fuels".

Contrast between Great Britain's plans for rapid development of peacetime atomic power, and America's slower, more cautious approach, has led to a sharp difference of opinion in this country. Defenders of American policy have frequently said that although nuclear power generation may be economically feasible in England, knowledge of atomic plants is not sufficiently advanced to justify large-scale construction in America of units that may rapidly become outmoded.

Wootton gave a different view, saying that plants of the current British type, with possible improvements, will still be built 25 years from now. He added that the power reactor now in operation at Calder Hall, in England, has advantages of simplicity and safety that are not inherent in more advanced types. Calder Hall has operated in a trouble-free manner, he said, and "present indications are that the expectations of designers will be fully met."

Recent proposals by British industry have rejected the idea of a slow, conservative development of reactors, and have called, instead, for construction of new units similar to Calder Hall but with four times the electrical-generating capacity. Industry has found no practical limit to the size of such reactors, the British engineer added.

Commenting on the shortage of trained engineers and scientists capable of developing atomic energy for peacetime purposes, Wootton said that this is a "most serious obstacle," but that steps have been taken to overcome it. These include establishment of a reactor school at Harwell, a major British research installation, and of industrial training programs and a Reactor Operation School at Calder Hall. In addition, many colleges have established courses in nuclear engineering and reactor technology, and two have instituted Faculties of Nuclear Engineering.

Atomic Testers Face Little Danger

Individuals helping to test atomic weapons face "considerably less danger" than the average automobile driver or pedestrian crossing a busy street, according to a speaker at the Semi-Annual Meeting of The American Society of Mechanical Engineers in San Francisco on June 12.

Marvin D. Martin, divisions head of the Weapons Engineering Division of the University of California Radiation Laboratory, said that engineers and scientists are constantly at work to make nuclear weapons safe for the people who use them and for surrounding civilian populations.

Martin pointed out that designers must guard against unintentional detonation as well as guarantee satisfactory performance when needed. If an aircraft should be unable to deliver its nuclear bomb to a target, for example, provisions must be made either for the plane to return to its base carrying a live bomb or to dump an extremely expensive weapon over an uninhabited area. "Not only must weapons be capable of being shipped by truck, airplane, railroad car and ship, but also they must have built-in safety features which insure that accidental nuclear detonations do not occur, even under unexpected emergency conditions such as fire or airplane crash."

Martin also pointed out that, with more atomic weapons being designed for use by troops in the field, designers must take into account the fact that they may be handled by comparatively inexperienced personnel. Engineers also concern themselves with the locations and climates in which weapons may be assembled and tested, methods of shipping and inspection, effects of high altitude and other factors.

Despite many elaborate tests and intricate safety devices designed to produce the safest and most reliable weapons possible, Martin added, the designers of nuclear devices "have occasionally arrived at the conclusion that the best, single, overall test to insure that our nuclear weapons will remain operative under all conditions is to give one to the average GI with the instruction, 'be careful of this'."

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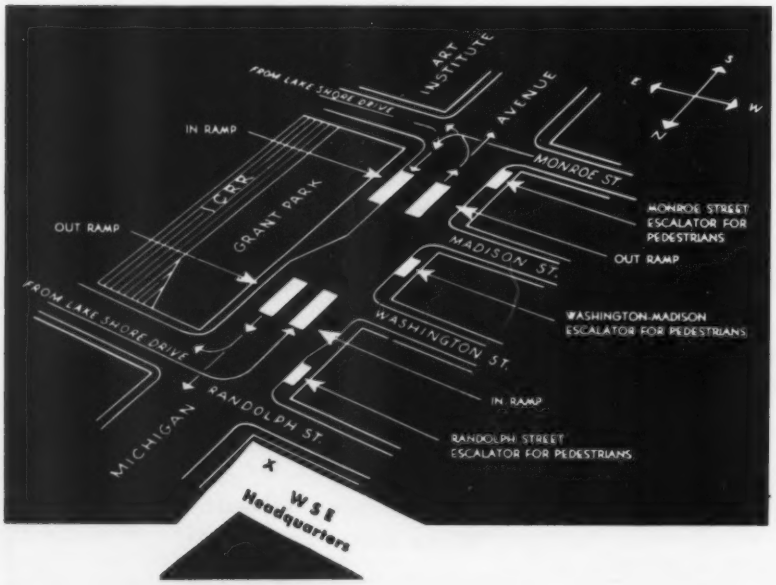
Below: map showing Park Department Underground Garage



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This is the conservative estimate of Caywood-Schiller, Associates, Chicago industrial and military operations research consultant firm, which makes such projections through the application of mathematical statistics, probability theory, economics, mathematical physics, and various branches of engineering.

For example, this research group recently solved a vexing problem for a department store chain which planned to substitute a single centralized warehouse for an existing system of separate warehouses. There was the problem of providing docking, unloading, and conveying facilities for the new warehouse. The extent of new facilities to be provided would have to take into account the change in traffic flows under the new system, the concurrent opening of several new stores, substitution of truck for rail deliveries, and several other related factors.

The problem involved was basically one of a "waiting-line" type. In this case the penalties of having a line of delayed trucks waiting in a public alley and street had to be balanced against the costs of constructing and maintaining additional service facilities.

A waiting line of trucks clearly involved out-of-pocket costs to the company —the trucks being in part hired by the company on a daily basis to provide warehouse-to-store deliveries. Furthermore, a conspicuous property of the problem was the absence of traffic arrival scheduling—and the apparent impracticality of enforcing such scheduling.

As an operations research study, solution of the problem was handled in the following manner:

A field survey was conducted, punch-card analysis made, mathematical models created, and new warehouse operations simulated by use of high-speed electronic computers; and, finally, management was presented with a detailed report of the way in which time lost in a waiting line would be affected by changes in truck servicing facilities.

This information enabled management to make the wisest move in modifying warehouse operations.

The operations research firm has applied its techniques to the solution of other waiting-line problems as well. For instance, the determination of such optimums as the number of check-out counters in a super-market, the number of telephone trunk lines at a transportation reservation office, and the most expeditious manner in which to handle baggage and check-in at an airline ticket counter have been accomplished by this firm.

The waiting-line or "queueing" problem not always is connected with the waiting of people. Sometimes, as in the instance of the department store trucking problem, it is equipment that waits. One case study, for instance, required the operations research specialists to determine the optimum number of maintenance men required to service factory equipment. In this instance, the machines needing repair formed the waiting line, and the maintenance men comprised the service facilities. The operations research techniques of queueing analysis were applied to predict exactly how the machine production time varied with changes in maintenance service. Then the best of most favorable amount and type of service could be selected by management.

Application of such higher math techniques and formulas is becoming more common in business and industry which today is extremely cost-conscious because of narrower margins of profit and increased production costs. It's one large segment of a highly technical professional field going under the general name of "Operations Research."

Operations Research came into being during World War II, when scientists were pressed into service by the Armed Forces to pit their theories and techniques against such problems as determining when fighter pilots should open fire on bombers, how lurking submarines should be located, and which would be the cheapest means of moving men and supplies around the world.

The military still is a major user of operations research, but the technique now has been applied to the operations of many different private companies.

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These consultants, through the application of operations research, have achieved considerable success in streamlining and economizing inventories as well as solving many other problems confronting modern industry.

Firms using the mathematics-inspired research team techniques represent virtually every type of business in America. Numbered among the users are such leading industrial firms as The General Electric Company, American Machine and Foundry Company, United Air Lines, Inc., Armour and Company, Sears-Roebuck and Company, Westinghouse Electric Corporation, Bell Telephone Laboratories, Celanese Corporation of America, and Standard Oil Company of New Jersey.

Most of these companies use operations research on specfiic problems, such as controlling vast inventories, determining the effectiveness of retail advertising, or improving the mixing of ingredients in prepared formulas. But a few also are using operations research on general business problems to develop business theories. Still others refer problems created by the complexities of their modern business operations to operations research consultant firms.

Activity in this field is expanding. Caywood-Schiller, for example, has performed operational research projects in such technical fields as production allocation and scheduling; reliability and maintenance analysis; expansion and replacement analysis; traffic and distribution analysis; warehouse and inventory control; electric computer application; and automation for manufacturing.

Still other consultants have applied operations research to such highly specialized fields as traffic control; accounting control; assembly line scheduling; quality control; accident control; forest resources management; fisheries management; labor utilization; utility dispatching; strip mining; storage water control; crop harvesting; sales promotion evaluation. and gasoline blending. Estimates are that some oil companies, for example, save on the average of 5 per cent or $3,500,000 of gross sales using these blending techniques in gasoline refining operations.

Enthusiasm is the leaping lightning, not to be measured by the horsepower of the understanding.

—Emerson

New Space Alloys are Needed

New alloys and new ways of using them will be required for long-range missiles and vehicles for space travel, F. L. LaQue, vice-president of The International Nickel Company, Inc., and manager of its Development and Research Division, said May 16. The results of these developments will prove to be valuable for many other purposes, he declared, adding that "as many, or more, beneficiaries will be found in industrial fields on this planet than among the people who make the celestial journeys or inhabit the new world they will visit."

LaQue was among a group of authorities on missiles, rockets and space travel who participated in a two-day conference in Birmingham, Ala., on "The Age of Space" sponsored by Southern Research Institute. Purpose of the conference was to focus attention on the significance to industry of current developments in the field. In his address, LaQue reviewed the destructive factors that may have to be dealt with and the properties of the metals that can be chosen to survive these destructive effects.

"It appears that the answers to many of the problems of materials for space vehicles will be provided by the answers to similar problems in connection with supersonic aircraft and long-range missiles," the speaker said. "These must operate under conditions that in many re-

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spects are even more severe than those to be encountered by space vehicles which presumably can more readily avoid the most destructive combinations of speed and altitude . . .

"It would appear that the frames and skins of space vehicles will have to be built of something better than magnesium or aluminum alloys—probably one of the precipitation hardened stainless steels or nickel-base alloys, such as Inconel 'X'. Depending on the velocities to be provided for, there may be a place for titanium alloys now usable up to about 800 degrees Fahrenheit, possibly in conjunction with other materials for components that will have to be strong at higher temperatures. Because of the relatively high density of these alloys, it will be necessary to take advantage of sandwich type composites so as to achieve maximum rigidity or resistance to deformation with minimum weight.

"Iron, nickel and cobalt-base alloys in wrought forms, including sheets, can be made to carry high loads for long periods at temperatures up to at least 1,500 degrees Fahrenheit. Molybdenum, chromium and possibly rhenium and tungsten-base alloys offer the greatest prospect of extending this limit . . . Of these, molybdenum seems to have been receiving the most attention . . . Considerable progress is being made in developing protective coatings for molybdenum, such as nickel-chromium alloy cladding, combinations of electrodeposited chromium and nickel, precious metals, ceramics and the like applied by various means, such as spraying and vapor deposition. It is reasonable to expect that sooner or later molybdenum can be protected so that it can carry high loads at temperatures over 2,000 degrees Fahrenheit for a useful period.

"Subject to limitations imposed by its relatively low melting point and only fair resistance to oxidation, copper is the most economically desirable of the common metals where heat dissipation is the principal consideration. Gold is attractive physically, but not economically. Iron has a much higher melting point than copper, but suffers from poor resistance to oxidation. While nickel occupies only a sort of midway position in the diffusivity rank, it provides in many cases the best combination of diffusivity, melting point and cost.

"Another attractive property of nickel is the facility with which heavy layers having good mechanical properties can be built up by electro-deposition so that fairly massive complicated shapes and sheaths can be achieved by electrodeposition."

In his concluding remarks, LaQue said that while the problems related to materials of construction for space vehicles will require continued and intensive attention to achieve the further improvements that are desirable, if not actually required, such materials problems will not be the limiting factors in the feasibility of space travel, nor is it likely that the date of the first voyage into outer space will be delayed unduly awaiting the solution of some problems of materials or fabrication.

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On this Job there's No Materials Problem

Eighth Air Force Engineers have at least one runway job under construction on which materials are no problem, reports *Engineering News-Record*. The project is on Fletcher's Island in the Arctic Ocean just 100 miles from the North Pole, where, the Air Force men are simply "ironing out" a 5,000-ft.-long runway of ice. Tarpaulins are spread over the rough ice and a hot air generator forces warm air under them. As fast as the ice melts, the canvas and the generators are moved further along and the water is permitted to refreeze, thereby producing a level surface.

U.E.T. Foundation Makes Grants

Engineering research will go forward on a wide front with new grants made by Engineering Foundation, a department of United Engineering Trustees, Inc., at its annual meeting held in New York on May 16. Appropriations for the 1957-1958 fiscal year total $69,000. They will initiate or advance 28 projects, which will receive nearly $1,000,000 in industry support. The projects to which funds have been allocated represent all the important branches of the profession. They are being carried out in university, government, and industrial laboratories all over the country under sponsorship of the major engineering societies.

This year Engineering Foundation is making a special grant of $3,500 for an important new project of the Column Research Council, which promises ultimately to yield safer, cheaper structures. A special grant—contingent on the project's receiving an equal amount of outside support—will be used in preparing a general guide for the preparation of specifications on the subject of metal columns and compression members. The new project is aimed at making use of new data relating to the strength of compression members by offering the profession an over-all guide, with optional clauses covering a variety of situations. It will supplement rather than supplant existing specifications and make available for practical application the results of scientific research. The proposed guide will be dedicated to the late Shortridge Hardesty, long-time member and chairman of the Column Research Council.

In the eleven years of its existence the Council, which is under the auspices of the American Society of Civil Engineers, has accumulated a great deal of valuable material on column behavior. Council headquarters have recently been changed from Lehigh University to the University of Michigan.

Alloys of Iron Research is receiving $5,000 to continue its work of publishing monographs devoted to important findings on carbon and alloy steels and cast irons. This June the project is issuing the fourth monograph of a new series, entitled "Boron, Calcium, Columbium, Tantalum, and Zirconium in Iron and Steel", which is of much interest to the manufacturers of jet engines and guided missiles. The new monograph contains a summary of valuable material on the complex, high-temperature alloys that have been developed in the past five or ten years. It is these new alloys which are making jet engines and more efficient power plants possible because they can withstand higher temperatures than ordinary steel. Alloys of Iron Research has been receiving Engineering Foundation support since its formation in 1929. It is a project sponsored by the American Institute of Mining, Metallurgical, and Petroleum Engineers.

An allocation of $4,000 goes to the Corrosion Research Council — also an AIME-sponsored project — which completed its first year on Dec. 31, 1956. One of the scientifically important facts already revealed by the Council's first program is that light slows down the rate of corrosion in water containing air. Furthermore, exposure to a beam of light apparently causes the oxide film on metal to dissolve. This research is being done in cooperation with the National Bureau of

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Standards. Since January the two groups have been engaged in a second joint project, which will explore the relation of stress to corrosion of metals. A study of the role of hydrogen is included in this subject.

Studies in High-Temperature Steam Generation, a long-time project sponsored by The American Society of Mechanical Engineers, will be given a token grant of $1,000. The latest development in this program is that, on the basis of findings of prototype equipment previously operated at the Naval Engineering Experiment Station at Annapolis, test equipment for determining the behaviour of alloy steels under high-temperature steam has been installed at the Philip Sporn Power Plant at New Haven, W. Va. After several months of shake-down testing, the apparatus has begun a three-year operation under planned steady-state conditions, in which specimens are subjected to combustion gases and steam at temperature levels between 1100 and 1500 F. Specimens will be removed for examination at regular intervals, the first set having been scheduled for observation this May. The High-Temperature Steam Generation Project is of vital importance to industry and is being heavily subsidized by manufacturers and by the U. S. Navy Bureau of Ships.

Of considerable concern to residents of coastal areas as well as to beach-front property owners is another research program that continues to receive Engineering Foundation support. The Council on Wave Research, which was set up to survey the various fields of water-wave action, had its origin in the Hydraulics Division of ASCE. It is now operating as an independent program. In its seven years of operation the Council has sponsored numerous conferences on coastal engineering and allied subjects. This fall it will have its Sixth Conference on Coastal Engineering, to be held in Florida under sponsorship of the University of Florida.

These projects are a typical sampling of the wide range of engineering and scientific work receiving Engineering Foundation support in this pioneer organization's forty-third year of operation. Since its formation in 1914 the Foundation has made sound use of its relatively modest income to initiate and develop important research programs that were later able to attract large-scale industrial backing. Its current endowment fund of about $1,500,000 includes a residual bequest of some $400,000 recently made available to it from the estate of the late Edwin H. McHenry, civil engineer and railroad executive.

Atomic Fuel Elements Will Go to Denmark

The Babcock & Wilcox Company on May 29 reported in New York that it has signed a contract with the Danish Atomic Energy Commission to make nuclear fuel elements for a tank-type research reactor the Commission is now building in Denmark.

The contract calls for 45 fuel element assemblies, including 33 standard units and 12 with provisions for controls. They will be fabricated from uranium enriched to 20 per cent of the U-235 isotope, the maximum enrichment permitted for use in foreign research reactors under President Eisenhower's "Atoms for Peace" program.

Delivery of the completed fuel element assemblies is slated for Sept. 1, and a tentative date of Oct. 1957, has been set for the reactor to begin operation.

B&W reported that its Nuclear Facilities Plant at Lynchburg, Va., is also manufacturing 48 fuel elements for the Livermore pool-type reactor in Palo Alto, Calif., a prototype of the Danish research unit.

Heat Transfer Meet Is Set for August

Program plans for the First National Conference on Heat Transfer to be held August 12-15 at Pennsylvania State University, University Park, Pennsylvania, have been completed. This conference, jointly sponsored by the Heat Transfer Division of The American Society of Mechanical Engineers and the American Institute of Chemical Engineers, will be the first time that the two groups have cooperatively sponsored an independent technical program, although there have been joint symposia presented at general society meetings in the past.

The program includes thirty-five technical papers on a variety of topics, and inspection trips to the "swimming pool" nuclear reactor and the Naval Research Ordnance Laboratory at the University.

There will also be a series of industrial exhibits.

Guest of honor at a banquet on August 14 will be Professor W. H. McAdams, for 43 years a member of the faculty of Massachusetts Institute of Technology. Professor McAdams is known internationally for his pioneering work in heat transfer and his textbook in the field has been an authoritative work for over thirty years.

Most technical sessions will be held in the air conditioned auditorium of the University's Hetzel Union Building.

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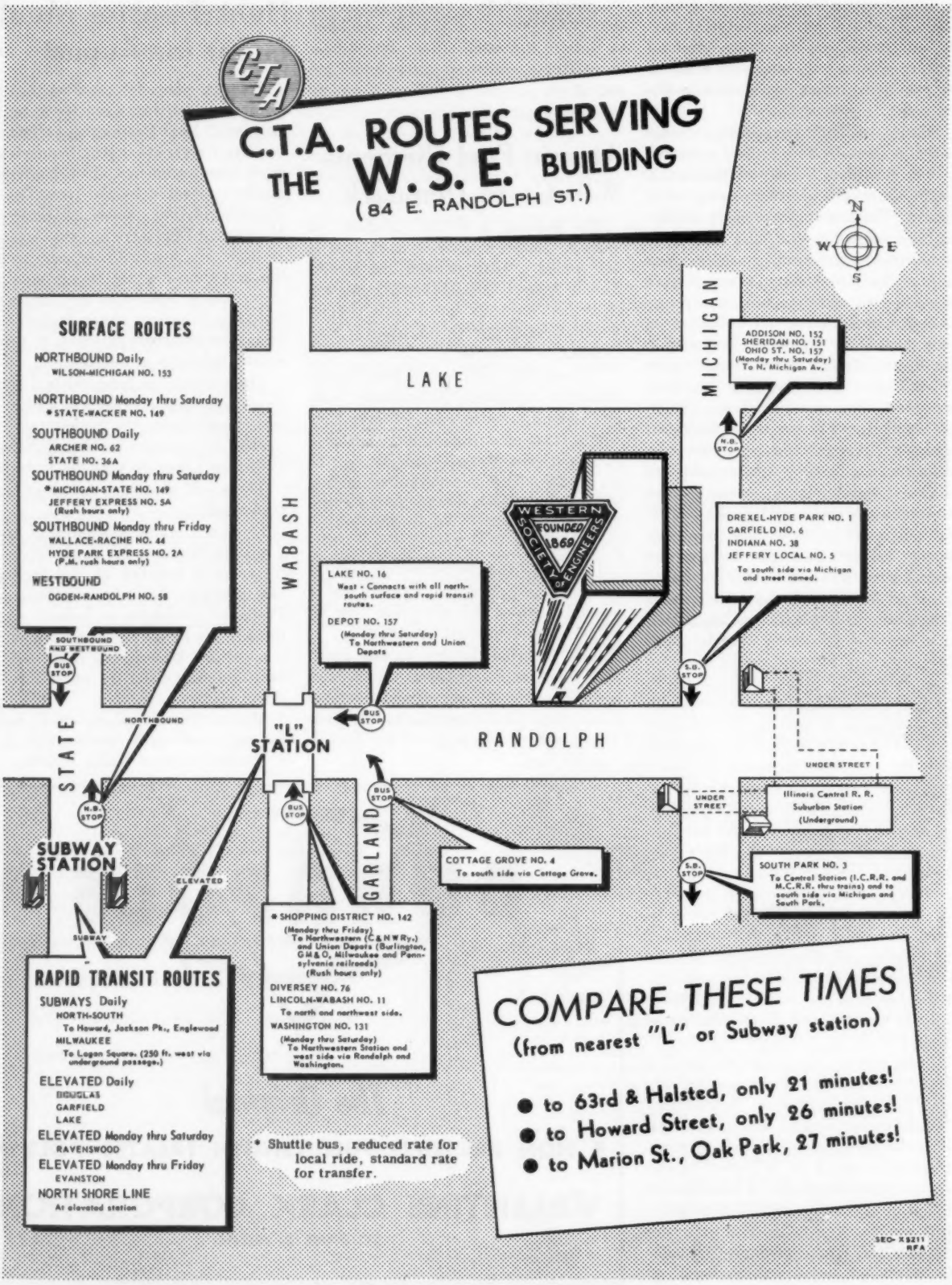
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An Exhibit Finds A Permanent Home

What does one do with an exhibit when one section of it weighs more than two and one-half tons, and has no market value? A practical and interesting answer to that question was provided recently in Chicago.

Thousands who viewed the impressive display of the Portland Cement Association at the 1957 Road Show of the American Road Builders Association found one of the most interesting portions of the exhibit to be an actual section of concrete pavement constructed to specifications of the Illinois State Division of Highways. The prototype section consisted of a 10-in. thick reinforced slab of air-entrained concrete with a sawed joint and skid-resistant surface, placed on a 4-in. thick, non-pumping granular subbase. One portion of the pavement slab was shown in cross-section to indicate the placement of mesh reinforcement. Built solely for the ARBA exhibit, the section measured 8x5½ ft., and weighed about 5,500 pounds.

Among those expressing considerable interest in the model slab were instructors in the Department of Civil Engineering of the University of Illinois, Chicago Division, at Navy Pier. To them, the prototype section represented a highly practical and rapid means of acquainting students with the design and construction features of modern, heavy-duty concrete pavement such as that now being constructed in Illinois and many other states as part of the 41,000-mile National System of Interstate and Defense Highways. In effect, the slab is a giant visual aid that permits a tangible, close-up look at an actual cross-section of air-entrained concrete pavement with reinforcing mesh in place, a skid-resistant surface and narrow, modern sawed joint.

Arrangements for transfer of the section were made by the Association, and upon completion of the Road Show the model was carefully crated and transported by truck to its new home at Navy Pier. Presentation was made by Leo M. Arms, manager of the Association's Highways and Municipal Bureau, to Dean Frederick Trezise and Professor Edward H. Coe of the Department of Engineering of the University's Chicago Division.

Atomic 3-D TV

British scientists are able to handle radioactive materials more than a half mile away by a novel TV arrangement that gives a 3-D picture, reports *Electronics*. Two cameras provide right- and left-eye views, which are superimposed. Viewed through polarized glasses, the scientists see a composite view in 3-D and can carry on their work by master manipultors that handle the distant radioactive material.

Book on Aluminum Wins Merit Award

Aluminum in Modern Architecture, recently published by Reynolds Metals Company, was awarded a Certificate of Exceptional Merit by the American Institute of Architects and its affiliated Producers' Council at the AIA convention in Washington, D. C., the week of May 13.

The two-volume Reynolds entry won the top award for basic technical literature in the 1957 Building Products Literature Competition sponsored by the two organizations. John R. Magney, AIA, chairman of the awards jury, presented the certificate to Maxwell M. Caskie, Jr., assistant vice president of Reynolds, at a Monday luncheon at the Sheraton Park Hotel.

Reynolds spent $500,000 on preparation of *Aluminum in Modern Architecture*, the first definitive study of the structural characteristics, applications and design possibilities of aluminum as a building material.

Volume I, by John Peter, uses over 400 photographs in describing exactly how and why aluminum was used in construction of 101 important buildings throughout the world. Included are tape recorded interviews in which 26 great architects offer thoughts about future trends in architecture.

Volume II, by Paul Weidlinger, is a technical handbook giving comprehensive engineering and design data, costs and specifications for the many uses of aluminum in buildings. It translates aluminum construction advances in the aeronautical engineering field into architectural engineering terms, and suggests new approaches for forward-looking designers.

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Patent Office Needs Engineers

The Patent Office is still desperately in need of engineers and scientists to serve as Patent Examiners, according to The New York Patent Law Association. The Association reports that while delays in the processing of patent applications in the Patent Office have been somewhat reduced during the past year, it still takes about ten months before a new patent application is first examined, and an average of three and one half years before a patent is issued.

These delays create uncertainty as to the patent status of new products and processes and tend to slow down or defer their adoption by industry and their introduction to the public. This situation should be of general concern because it can handicap the larger corporation and can be critical for the individual inventor and the small businessman whose operations revolve around patented products and processes.

The key to this log jam is more Patent Examiners—technically trained men and women who will evaluate applications for patents in the technical fields constituting industry's latest frontiers to determine whether the new suggestions are novel and whether invention is involved. While there are openings in all areas, electrical engineers and electronics specialists are particularly needed.

Men and women holding college degrees in engineering or applied science, or a degree with a major in chemistry or physics, or with certain combined credits in these fields, are eligible for appointment as Patent Examiners, without examination, upon application to the Commissioner of Patents in Washington, D. C.

Under the revised salary schedule the minimum starting salary is $4,480 per year. Promotion to $5,335 per year may be expected after three months' service, based solely on ability and work performance. With as little as six months of professional experience in engineering, chemistry, physics, or patent law, the starting salary is $5,335 per year with an expected increase to $6,250 nine months later. It is normal for an examiner to be earning $8,215 annually in less than five years after graduation from college, with additional opportunities for promotion up to $13,760.

These are attractive openings since they offer stable, highly-respected, quasi-judicial positions which afford an unusually large degree of professional freedom. Patent examiners have the benefit of liberal vacations, cumulative sick-leave and pension benefits, and working in the nation's capital has its own fascinations. On-the-job training also offers opportunities for broad professional development in both the technical and legal aspects of the work. The value of Patent Office training is evidenced by the high demand for experienced Patent Examiners in industry.

The Patent Office during each of the past few years has been adding an increasing number of women to its staff of Examiners, and the Association stresses the fact that the Patent Office offers an unusually satisfying career for women with an engineering background.

Food Classification

About 12 per cent of total food business is accounted for by what the U.S. Census terms "Miscellaneous Food Preparation." Within this group is the section: Foods not elsewhere classified. This smaller grouping—made up of ready-mix desserts, potato chips, coffee, popcorn, etc.—saw a 98 per cent increase in value of shipments in 1954, states *Food Engineering*.

Air Pollution Papers Presented in St. Louis

Several countries, including Russia and England, are ahead of the United States in dealing with some aspects of air pollution, it was revealed in technical papers scheduled for presentation June 5 at a special session on air pollution in St. Louis, Mo.

In a program sponsored by The American Society of Mechanical Engineers, George Tipkin of the New York City Department of Air Pollution Control, reviewed Soviet progress in the field, as reported in two recent Russian publications. Among other advances, the Soviets are reported to have established limits on the amount of foreign matter in air that can safely be breathed by the public. Similar standards have not yet been worked out in this country.

From England comes news of a process to reclaim chemicals from smokestacks, converting them to fertilizer. The develment, reported by T. Kennaway of Simon Carves, Ltd., British manufacturers of chemical processing equipment, depends on adding ammonia to the sulphur found in most flue gases to make ammonium sulphate, often used to enrich farm land.

Also on the program was a discussion of means of controlling air pollution from automobile engines, by two representatives of the U. S. Public Health Service.

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Retrieval Symposium Attracts 900

More than 900 scientists, engineers, administrators, documentalists, and librarians attended the Information Retrieval Symposium sponsored by Western Reserve University in Cleveland, April 15-17. Registrants came from 35 states and five foreign countries.

Representatives from all branches of science, engineering, humanities, social sciences, medicine, and law witnessed a broad range of working systems, in current use, for recording, storing and retrieving information ranging from hand machine sorted cards to systems using computers or computer-like devices. Sponsored by thirty professional, industrial and governmental organizations and held in the exhibition hall of Cleveland's Masonic Auditorium, the conference was a startling eye-opener to the majority of those in attendance. The age of automatic storage and retrieval of information is already here, although from the point of view of computer engineering it must be judged to be in the early stages of development.

The WRU conference provided a common meeting ground for a wide variety of talent and interest in the information handling field and brought to those present an awareness of the systems now in use pointing up their advantages and limitations. It also presented in a forceful manner the immediate problems facing information retrieval system design in the United States.

Some of the systems demonstrated were linked to distant points in the United States and overseas by telephone, teletype and facsimile services provided by the Ohio Bell Telephone Co., The Bell Telephone Company of Pennsylvania, R.C.A. Communications Inc., The American Telephone and Telegraph Co. (Long Lines Dept.). Questions received from England, Holland, Germany and scattered points in the United States and directed to the information systems set up at the symposium were answered before the eyes of the audience.

The United States Patent Office presentation featured teletype transmission of several questions, in the field of steroid chemistry, to the SEAC computer at the Bureau of Standards, Washington, D. C. While the operation of the SEAC computer was being described to the Cleveland audience, replies to the questions sent to Washington were received and reported to the conference assembly.

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Automatic Electric Moves to Northlake

Automatic Electric Company began moving its facilities from Chicago to suburban Northlake, Ill. on May 24th. The moving operation, according to the National Furniture Warehousemen's Association and the Movers' Association of Chicago, will be the largest ever undertaken in the Midwest.

Leslie H. Warner, president of Automatic Electric and chief executive officer of the Manufacturing, Sales and Research Division of the General Telephone System, said the move will be completed in about four months. Warner emphasized that the move has been planned so that production will not be interrupted.

Various departments will be moved in reverse production line order. A fleet of trucks will be kept in almost constant service to shuttle parts from departments still operating at the old location to departments already moved to the new facilities at Northlake.

Warner says that Automatic will double production.

Groundbreaking ceremonies at the new plant site which were attended by many Chicago area industrial leaders and dignitaries from the telephone field, were held on April 16, 1956.

The new Automatic Electric plant stands on the 167 acre site of a country club. The building, one of the largest industrial structures in the Middle West, will house the General Telephone Laboratories and the general offices and United States production facilities of Automatic Electric. Both organizations are parts of the General Telephone System.

All the athletic stadiums of the Big Ten conference schools would fit on the factory floor of the new plant. It contains more than 1,520,000 square feet of floor space under one roof. Present facilities of the company are spread through 17 multi-story buildings on Chicago's Near West Side.

Joyce Brothers Storage and Van Company of Chicago estimates that Automatic's office furnishings, stock and raw material alone will fill 200 tractor-trailer moving vans and require 50,000 man-hours just to load and unload.

In addition, Pennoyer Merchants Transfer Company will handle the moving of some 1100 machines, weighing an estimated total of 2,600,000 pounds.

Underpaid?

(Continued from Page 6)

295 salary reports of 65,169 engineers. The median salary reported by year of entry into the profession appears in Table 4. The upper and lower-quartile lines in this table begin close to the median and become more divergent as the length of service becomes longer.

Table 4
Salaries of Engineers in Industry by Year of Entry Into the Profession [a]

Year	Median
1952	$4284
51	4664
50	4822
49	5106
48	5382
47	5617
46	5582
45	5840
40-44	6593
35-39	7714
30-34	8043
25-29	8792
20-24	9158
15-19	9399
10-14	9126

[a] Source: Engineers Joint Council, 1953 report, "Professional Income of Engineers."

Engineering Salaries in Industry

A comparison of salaries by various industries will be helpful. The years 1940 to 1944 show the greatest number of engineers entering industry, and a comparison of salaries for this bracket only is shown in Table 5. The salaries given are median figures for the several industries reporting.

Table 5
Salaries of Engineers by Type of Industry [a]

Type of Industry	Median
Industry total	$6593
Chemical allied products	7195
Machinery manufacturing	6333
Electric machinery	6990
Transportation equipment	7446
Scientific instruments	7050
Metal, mining, and primary metal fabricators	6423
Extraction of crude oil and gas	6757
Miscellaneous services	7440
Other industries	6736
Civilian government	5827
Engineering education (teachers' salaries only)	4632
Engineering education (total income)	6148

[a] Source: EJC 1953 report.

The table shows a salary difference by industry, ranging from a high of $7440 in the transportation-equipment industry and also miscellaneous services to a low of $4632 for engineering educators. The median salary for all engineers in this report is $6593. The most disheartening fact to be revealed from this comparison is the low salary of engineering educators. Even working part time at jobs other than teaching, their total income did not come within $400 of the median for all engineers Civilian government engineers, earning $5827, were over $700 lower than the median. Both of these brackets should receive our careful attention and thought. The salary differences shown in this age group are not an exception. A similar range of salaries would be shown for age groups other than the one discussed.

Ratio to Skilled Labor

Of all the reports and statistics read in the preparation of this paper none was so disturbing as the comparison of the growth of engineers salaries' with those of skilled labor. In 1939, professional engineers reported a median income for the newest engineers of $1590 increasing to $6017 for the men with 35 to 39 years' experience. By the year 1943 the newcomer's median had increased 60 per cent to a salary of $2564. The 35 to 39-years'-experience man had an increased to $6564 or only 9 per cent. A 1953 report of EJC shows that the beginning salary of men entering the field in 1952 was $4284, an increase of 69 per cent over the 1939 figure and 67 per cent over the 1943 figure. The experienced man has realized a growth of salary to $9399, an increase of 56 per cent over 1939, and an increase of 43 per cent over 1943.

To appreciate how serious this situation is becoming, consider the criterion that a man's salary should be twice the existing starting wage when he has had 15 to 20 years' experience. This amounts to an annual salary increase of 4.7 per cent per year! A curve of starting rates from 1920 to 1953 shows an ever-increasing rate of pay from $1000 to the present of about $5000. A curve of double the starting rates after 15 years' experience, developed from the first curve, will show a rate of increase in pay that is astronomical. Such increases could not be given without seriously affecting the economy of the country. The problem cannot be dropped here even if the projected salary is beyond present standards, because the experienced engineer must be protected and

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the new engineer must be shown rates of salary increase that are in keeping with other professions. If we cannot do this we will not continue to attract the quantity and quality of men demanded by industry.

The new engineer, in 1940, received a salary that was 65 per cent of the pay of the skilled workers. The engineer with 15 years' experience in 1940 was receiving a salary 1.95 times the pay of skilled workers. In 1951 the 15-year man was getting only 1.25 times the pay of skilled workers while the one-year man was getting 0.70 times the pay of skilled workers. The one-year man had actually improved his relationship 7.6 per cent.

The engineer with 5 years' experience took the worst beating. In 1940 his relationship was 1.20 and by 1951 it had dropped to 0.94 or a loss of 21.6 per cent. This same engineer with five years' experience in 1940 is the man with 16 years' experience in 1951. If the increase in skilled workers' wages is about the same as the increase in cost of living, then this engineer has not increased his purchasing power in 11 years of labor. Engineers should take a careful look at this ever-narrowing gap between the wage scales of skilled and semiskilled workers and their own salaries.

Education and Compensation

Further education and training seem to be one way that engineers can promote themselves financially and advance to jobs in their company with more prestige.

The figures in Table 6 show that engineers have the highest pay of all the sciences reported and at the same time the lowest percentage of PhD's in their respective fields. If the young engineer has the means of inclination toward further education he will be well repaid for the time spent in gaining this additional training. Many companies are encouraging their men to continue their training, with some companies paying all or part of the tuition costs.

Management and its related functions also attract engineers. A survey of 900 top executives disclosed that 45.5 per cent had a major educational background in engineering and science. It has been further estimated that 60 per cent of all engineers are engaged in administrative work 20 years after graduation. One of the reasons that the engineers' top salaries level off in the older age brackets is that many of the outstanding men leave engineering and move to administrative positions. If you feel that this is the road you will follow, then you must develop the techniques and talents that make for a successful executive.

The professional development of the engineer who wishes to grow must not be neglected. If you are not registered, then you must take this important step. If you are registered, then you should use your seal and display your certificate. Belonging and participating in the activities of a national society will develop professional attitudes that will assist you to mature in the correct direction.

Personality development of the engineer who wishes to get ahead should not be neglected. A good personality is an asset that no one can afford not to develop.

Table 6

1948 Median Income of Scientists With PhD's, and Per Cent in the Field Possessing PhD [a]

	Median	Per Cent in Field
All fields	$7070	62.4
Chemistry	6880	78.4
Engineering	8000	33.3
Physics and electronics	7350	70.7
Earth sciences	7780	63.7
Agriculture	6670	55.9
Biology	6250	75.9
Fields related to medicine	6850	46.7
Mathematics and statistics	7350	83.2
Psychology	7940	93.8

[a] Source: U. S. Dept. of Labor, Bureau of Labor Statistics Bulletin, "Employment, Education, and Earnings of American Men of Science."

Some Conclusions[4]

On the surface it would appear, based on annual income averages, that the legal and medical professions in most areas receive a greater compensation for equally important services than the engineering profession. Therefore, by this comparison, the engineer is generally underpaid. This situation should, of course, be tempered by local standards with some consideration given to the fact that part of each engineer's compensation is not received in the form of monetary reward but in the form of monumental accomplishment,

[4] By Ralph Witherow, Stearns-Roger Manufacturing Company, Denver, Colo.

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personal satisfaction, and kindred community spirit.

Relation to National Economy

However, before a conclusion is reached in this regard, some important factors in connection with our national economy should be considered. "The true test of any system is the ability of that system to defend itself in the marketplace!" And upon this premise we must agree that as a nation we must have the benefit of a world market to absorb our full peacetime production, as we have not yet developed a successful system of economic perpetual motion. In order to have this market and maintain it, we must be competitive in the creation of engineering products. In a rather feeble attempt to meet this requirement we are currying a very dangerous practice. In many cases we are compromising quality for quantity, in a high-class game of "economic Russian roulette." We know our competitors have greatly increased their supply of technical personnel and production facilities in recent years. This has been done without noticeably raising their standard of living. These factors represent a rather serious situation and tell us that if we hope to maintain an economic balance in a highly competitive world market, we are going to have to put our own house in order. The solution to this impending problem seems to be opposed to the general premise of this paper, that engineers are underpaid. The following facts are offered for your consideration and study: For the past ten years we have experienced an ever-increasing spiral of inflation from which individuals have benefited less and less. As you know, labor costs have continued to rise, and material costs have continued to rise as a direct result, but as an end result, the cost of living has reached an all-time high.

Increasing Standard of Living

In many respects, we resemble the children of Babylon, building a tower far out in space whose proportions are exceeding the wildest imagination of its founders. As you well know, we have just witnessed the inception of another round of increases which will affect people at every level one way or another. In short, we are going to build our tower somewhat higher but we are not going to fortify its foundation with a stable economy. As engineers, every one of you knows better than that. Our ever-increasing standard of living is very quietly pricing us out of a world market. This high standard of living amounts to a veneer of convenience to which we have become accustomed and which we have accepted as a necessity, but we must not continue to pursue the dictates of our personal wishes and desires while ignoring our national economy. With these exceptions we have established that, by and large, engineers are underpaid. We have also agreed that engineers' compensations are many and diversified.

U. of M. Student Wins NEC Fellowship

A University of Michigan student has been awarded the National Electronics Conference fellowship in electronics for the 1957-58 academic year.

The award is the first to be given under a recently adopted program for sponsoring advanced study in electronics, according to Dr. C. E. Barthel, Jr., conference president.

The winner, chosen in national competition, is Richard T. Denton, currently working toward a doctor's degree in electrical engineering. He received master and bachelor degrees at Pennsylvania State University. Denton plans study in electronic systems analysis and design.

The NEC fellowship, worth $2,500, is for a year of graduate study at any of eight colleges and universities participating in the conference.

These include Illinois Institute of Technology, Northwestern University, and University of Illinois as sponsors, and Michigan, Michigan State, Purdue, Notre Dame, and Wisconsin universities as cooperating institutions.

The sponsoring group also includes the American Institute of Electrical Engineers and Institute of Radio Engineers, with the Radio-Electronics-Television Manufacturers Association and Society of Motion Picture and Television Engineers as participating members.

The National Electronics Conference is held annually in Chicago for discussion of advances in electronic research, development, and application.

The 1957 meeting—the 13th—will be held on Oct. 7-9 at the Hotel Sherman.

Last year's conference was attended by nearly 10,000 scientists, engineers, educators, manufacturers, government officials, and students.

Chemical Contribution

A chemical company has granted the National Academy of Religion and Mental Health $10,000 to provide fellowships to theological students who want to become chaplains in mental hospitals, reports *Chemical Week*.

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Spacemen Need Auxiliary Power

The lives of tomorrow's space travelers will depend on work being done by engineers today to develop compact, reliable, auxiliary power systems, according to a technical paper which was delivered June 13 at a meeting of The American Society of Mechanical Engineers in San Francisco.

"The occupant of a space vehicle will be dependent on an auxiliary power supply for heat, communication, course correction, pressurization, simulated gravity (if necessary) and many other necessities," according to a paper written by three engineers of the Aerojet General Corporation. Auxiliary power systems are defined as those which draw their energy from some source other than a craft's main rocket or jet engine.

The three engineers, D. G. Burdick, P. I. Wood and J. S. D'Abusco, pointed out that early models of rockets and ramjets required comparatively little auxiliary power, which could usually be supplied by storage batteries. Today, however, mechanical power is needed for fuel pumps and for refrigeration to keep critical areas from overheating; electric power is needed for control systems and instruments; pneumatic power is needed to maintain proper pressures, and hydraulic power is needed to operate rudders or control tabs.

Current approaches to the problem include systems using liquid oxygen and either solid or liquid fuels. Gases created by the burning of these materials power a gas turbine, which in turn, runs an electric generator, pumps or other machines. Other systems rely on bottles of compressed gas for their energy source, while aircraft flying within the atmosphere may depend on air scooped in.

The Aerojet engineers point out that on high speed aircraft, such as those in use today, "Auxiliary power supplies can minimize the danger resulting from engine failure . . . by providing power to maintain cabin pressure, radio communication, cabin heat and oxygen supply until the pilot can bring his craft to lower levels and prepare a method of escape."

Development of such systems may require about as much effort as is required to develop the main engine of a rocket, the authors said. Problems include the need for reliability, compactness, light weight, resistance to heat, high efficiency and safety.

A second paper at the same session written by W. R. Chapman and T. C. Noon of Thompson Products, Inc., described specific systems being developed by their company, particularly for use in guided missiles, and pointed out that development of a complete auxiliary system requires from three to five years of engineering work.

Plastic Steel Design

A new structural design method which lowers the cost of steel building construction was described at a conference at Illinois Institute of Technology, Chicago, on Mar. 11.

The meeting for structural engineers and architects was co-sponsored by Illinois Tech, the American Institute of Steel Construction, and nine steel fabricating companies in the Chicago area.

The new technique, called "Plastic Design in Steel," reduces both the amount of steel used and design time. It proportions all of the members on the over-all strength of the complete structure, in contrast to older design methods based on the working stress of the individual steel members.

The program included discussions of the reasons for the plastic design method, methods analysis, experimental verification of the plastic theory, and plastic design examples.

The speakers, all of whom have been active in the development, application, and teaching of the method, include: Dr. Lynn S. Beedle, assistant director, Fritz Engineering Laboratory, Lehigh University; Theodore R. Higgins, director of engineering and research, American Institute of Steel Construction; A. L. Small, regional engineer, AISC, and Dr. Eban Vey, civil engineering department, Illinois Tech.

Firms cooperating in the conference were Allied Structural Steel Companies, American Bridge Division of United States Steel Corp., Bethlehem Steel Co., Federal Iron Works, Hansell-Elcock Co., Mississippi Valley Structural Steel Co., Ryerson Steel Co., Vierling Steel Works, and Wendnagel and Co.

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Radio Pioneer Awarded Medal

Ronald James Rockwell was announced at the June Commencement exercises of Iowa State College as the 1957 winner of the Marston Medal. The medal is awarded annually in memory of the late Dean Anson Marston of the Division of Engineering to an alumnus in recognition of outstanding achievement in the field of engineering.

Rockwell, a 1927 graduate in electrical engineering, was born in Omaha in 1904. When only 12 he obtained a license for amateur radio station 9VE, and started a daily broadcast for the Omaha Weather Bureau in 1920. When such amateur broadcasting was prohibited, the station was given a new license and became WNAL. In 1922, WOAW (now WOW) was constructed and Rockwell became chief engineer. In 1923 he entered Iowa State College.

During his student years he was on the staff of the College broadcast station, WOI, and was made chief engineer in his senior year. He was responsible for much of the equipment design and construction as the station increased its power from 250 watts to 5000 watts.

After graduation from Iowa State he joined the staff of the General Electric Company as a test engineer. In 1928 he resigned and became a consultant engineer for broadcast stations.

In 1929 he joined the Crosley Corporation as engineer in charge of audio circuit and speaker development. In 1946 when the broadcasting branch of the company was incorporated as the Crosley Broadcasting Corporation, Rockwell became vice president and director of engineering of the new organization.

During his association with the Crosley Corporation, Rockwell's engineering and administrative activities have been many and varied, including much pioneering in electronic circuitry and in high power broadcasting. Involved in this high power category is the 500,000 watt WLW transmitter, the six 200,000 watt "Voice of America" transmitters, comprising the largest unit of the United States Information Agency, which entailed much original design and development. In the field of television, Rockwell was responsible for design and construction of Ohio's first television station, WLWT, which has now grown to include WLWD in Dayton and WLWC in Columbus as well as WLWA in Atlanta, Ga., and the recent authorization for a television station in Indianapolis, Ind., all of which operate at maximum authorized power.

In the development of high fidelity radio, Rockwell has been granted several patents of basic nature covering circuitry now used by many manufacturers, and of more recent date is his new hi-fi modulation system for AM transmission known as the "Rockwell Cathanode Modulation System."

Rockwell is a member of nine professional societies and a Fellow of the Institute of Radio Engineers and the American Institute of Electrical Engineers. He was given the "Outstanding Engineering Award for 1956" by the Engineering and Scientific Societies Council of Cincinnati.

Rockwell is a holder of over 20 United States patents covering radio and television transmission and receiving equipment. In addition to patents already granted, his continued technical efforts are shown by a number of patents now pending.

The Marston Award, represented by the medal, was established by Iowa State College in 1938. The award was inspired by Anson Marston, professor of Civil Engineering from 1892-1920, dean of engineering from 1904-1932, and dean emeritus at the time the award was established.

A Board of Award selects a winner each year. On the board is one representative from each of four engineering societies: the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Institute of Chemical Engineers. Four members are engineering alumni, one chosen each year for a four year term by the class which is celebrating its twenty-fifth year reunion. The dean of engineering of the Iowa State College is ex-officio chairman of the board.

The award is made only to an engineering alumnus of at least 30 years standing. Since 1939 no candidate has been eligible for election until his name has been before the Board of Award for one year. The term "engineering alumnus" means one who has received an earned bachelor's, master's, or doctor's degree in some branch of engineering at Iowa State College.

Eligible for the award are graduates engaged in technical design and construction and those who plan, develop, and manage enterprises in the fields of manufacturing utilities and civic betterment as well as engineering, teaching and research, and activities in National engineering societies.

Bright-eyed Robot

"A robot with X-ray eyes" — that's how General Electric describes the munitions tester built for the Army Ordnance Corps. With X-ray vision piercing 3.5-in. artillery rockets, the unit detects internal flaws, informs a digital computer, which decides if the defect is serious enough to reject the rocket, according to *Chemical Week*.

French Plastics

France's plastic output in 1956 hit a record 125,000 tons, *Chemical Week*, reports. In 1950, French plastic production was only 33,000 tons. Tops in output was vinyl resins followed by phenolics and polystyrenes.

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Reviews of Technical Books

Thermochemistry

Metallurgical Thermochemistry, by O. Kubaschewski and E. Ll. Evans, John Wiley & Sons, Inc., New York 16, N. Y. Second edition, 1956. 410 pages. Price $10.00.

The first section of the book discusses the theoretical basis, and consists largely of formulas necessary for applying fundamental data to reaction problems. Following this, the authors describe the main experimental techniques used to determine the thermochemical data, and point out the relative advantages and disadvantages of the various methods.

A third section describes methods of estimating values that cannot ordinarily be determined. In Part 4, the authors supply, via tabular form, the values of thermochemical constants for a large number of elements and compounds of possible metallurgical importance. The final section of the book contains examples of the practical applications of thermochemical methods.

Dr. Kubaschewski is senior principal scientific officer at the National Physical Laboratory in Teddington, Middlesex, England. Mr. Evans is senior scientific officer at the Chemical Research Laboratory in the same city.

Angular Momentum

Elementary Theory of Angular Momentum, by M. E. Rose, John Wiley & Sons, New York 16, N.Y. 1957. 248 pages. Price $10.00.

Dr. Rose, while realizing that formalism can not be avoided, nevertheless presents his subject in the simplest terms possible. To achieve this, his treatment is based on two delimiting factors. First, he is concerned only with the properties of rotations because of their close connection with the concept of angular momentum. Second, the reasoning is inductive; as the theory develops, a smooth connection is effected with those aspects of quantum mechanics that are, comparatively speaking, common knowledge. A wider audience is thereby assured as both ideas and analysis achieve greater transparency and simplicity, with little if any essential loss in power and elegance in the methods.

In Part A on general theory, Dr. Rose reviews the basic principles and goes on to the angular momentum operators, coupling of two angular momenta, transformation properties under rotations, irreducible tensors, and Racah coefficients. Part B, covering applications, includes discussions on the electromagnetic field, static interactions, particles of spin $\frac{1}{2}$, oriented nuclei and angular correlations, angular distributions in nuclear reactions, and identical particles.

The book originated as a series of lectures given at the Oak Ridge National Laboratory where Dr. Rose is chief physicist. The author's previous book, *Multipole Fields*, was published in 1955.

Surveying

Surveying, by Charles B. Breed, John Wiley & Sons, New York 16, N.Y. Second edition, 1957. 495 pages. Price $5.50.

This concentrated volume, stressing the theory and practices most commonly encountered by practicing engineers and surveyors, has been revised from start to finish to accord with modern procedures.

The chapter on aerial surveying and photogrammetry has been completely rewritten to emphasize the applications of this method for producing maps and obtaining survey data for engineering projects. New illustrations and text describe optical transits of European design, and descriptions now appear on the self-leveling level and tilting levels with optical reading systems. The author has brought astronomical data, illustrative problems, and the isogonic chart up to date, and expanded his treatment of circular curves. In addition, a new table gives radii and their logarithms for different degrees of curve both by arc and chord definitions.

Present chapter headings include: surveys and their purposes — sources of information; measurement of distances, direction, and angles; the engineer's level and its use; traverses and land surveys; calculation of closed traverses and land areas; the United States system of surveying public lands; contours; stadia surveying with transit and plane table; aerial surveying; lines and grades; cross-sections — volumes; plotting and finishing maps; and miscellaneous problems. Nearly 100 pages of tables conclude the volume.

Dr. Breed is emeritus professor of civil engineering, the Massachusetts Institute of Technology. In the preparation of this edition, he was assisted by Alexander J. Bone, also of M. I. T.

Iron and Steel

Boron, Calcium, Columbium, and Zirconium in Iron and Steel, John Wiley & Sons, New York 16, N.Y. 533 pages. Price, $14.00.

Consisting of four individual monographs, the book begins with R. A. Grange's discussion of boron in iron and steel. The second section on calcium has been prepared by F. J. Shortsleeve and D. C. Hilty. Part 3, written by W. O. Binder, covers columbium, and in Part 4, zirconium is discussed by George T. Motock and C. M. Offenhauer.

Among the many points included for each element are its methods of extraction and preparation, engineering properties, its effect on metals, and its applications. Extensive bibliographies follow each section, and a general subject index is augmented by an individual name index for each element.

The preceding three volumes in the series include *Aluminum in Iron andSteel* by Samuel L. Case and Kent R. Van Horn, *Nickel in Iron and Steel* by A. M. Hall, and *Titanium in Iron and Steel* by G. F. Comstock. The editor and director of Alloys of Iron Research is Frank T. Sisco.

Eli Whitney, Inventor, Honored by Lectures

The American Society of Tool Engineers has announced the establishment of an Annual Eli Whitney Memorial Lecture Series, in commemoration of Eli Whitney, founder of modern tool engineering and American mass-production methods.

Each year the honor of delivering the Eli Whitney Memorial Lecture will be awarded to an outstanding contributor to industrial progress who has "demonstrated superiority in the quality of achievement and caliber of professional service in applying knowledge of the science of tool engineering to the needs of industry."

In making the announcement, Howard C. McMillen, ASTE president, said "In choosing its candidates for the lecture series, ASTE will be looking for the man who best emulates the inventive, inquisitive spirit of the teacher-poet-lawyer-mechanic-businessman in whose honor the series is named—Eli Whitney."

Though it is well known that Eli Whitney invented the cotton gin, which changed the entire economic complexion of the South in the early 1800's, he was also responsible for the much more significant achievement of being the first in introduce the use of standardized parts to manufacture a finished product on a mass-production basis. This he did when he contracted to make 10,000 muskets for the U.S. government in what was then an impossibly short period of time by the conventional handicraft methods of his dav.

First to be honored in this series is Louis F. Polk, vice-president of Bendix Aviation Corporation and president of the Bendix Sheffield Division in Dayton. Ohio, who delivered the initial lecture in March at ASTE's Silver Anniversarv observation in Houston. Polk selected our country's "Heritage and Growing Abundance" as his topic.

An accomplished speaker, author and tireless promoter of industrial standards. Polk was responsible for his company's establishment of the Eli Whitney Metrology Laboratory, which provides industry and government with highly precise measurement and inspection services, using precision standards of light-wave accuracy.

Although Polk himself has long been an active member of ASTE, this annual award will not be restricted to ASTE members alone, but will be given to the American who best exemplifies the criteria already set by Eli Whitney.

Argonne Graduates Fourth Nuclear Class

Forty-seven foreign students from abroad and thirteen American students comprised the fourth class to be graduated from the International School of Nuclear Science and Engineering at Argonne National Laboratory.

The commencement exercise was held on May 24 in the Physics Building cafeteria on the Laboratory's grounds near Lemont, Ill.

Most of the graduating class, according to Dr. Rollin Taecker, director of the school, were to leave the Chicago area the following day on an inspection trip of nuclear energy research and development centers in the western United States.

On their inspection trip, the graduating students were scheduled to visit Grand Junction, Colorado; Salt Lake City, Idaho Falls, Idaho; Ogden, Utah; San Francisco, California; San Jose, California; Los Angeles, California and other cities.

The International School of Nuclear Science and Engineering was founded March 14, 1955, as a part of President Eisenhower's "Atoms for Peace" program. Since then, 162 foreign and 65 American students have been enrolled in its classes. The foreign students have represented 38 free world nations.

In cooperation with Pennsylvania State University and North Carolina State College, the International School at Argonne trains graduate and post-graduate students in nuclear science and engineering in a nine-month course.

Dr. Farrington Daniels, chairman of the University of Wisconsin chemistry faculty, was the keynote speaker at the commencement. Dr. Norman Hilberry, director of Argonne National Laboratory, presented graduation certificates to the class members.

1958 Tool Show to be Held in Philadelphia

Announcement of plans for its 1958 Tool Show has just been made in Detroit by the American Society of Tool Engineers. Site of the '58 Tool Show will be Philadelphia's Convention Center, which last hosted the event in 1954.

Some 29,000 engineers and executives registered for the 1954 Show which included more than $10-million worth of manufacturing tools and equipment. This figure skyrocketed to more than $15-million at last year's Tool Show in Chicago and attendance climbed to 36,000 certified registrants.

The 1958 ASTE Tool Show will be open seven working days from May 1-8 (closed Sunday) from 9:00 - 6:00 p.m. A complete integrated technical program of papers, panels, seminars, plant tours and related activities will also be offered as in the past.

Exhibitor space assignments for the Show began on June 10.

Traveling TV

In Britain, they've hit on a gimmick to get more passengers on the railways—entertaining the travelers with closed-circuit television, *Electronics* reports.

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News of Engineers

Two Western Society members have been honored by being elected to serve on the Association of Telephone Pioneers of America Executive Committee.

William V. Kahler, Past President and Honorary Member of WSE, was elected as senior vice-president for one year and George S. Hall, MWSE, as vice-president for two years effective July 1, 1957.

This Association, which was established in 1911, is the largest society of its kind in the world and has over 185,000 members in the United States and Canada. Those who have been in the telephone industry for 21 years or more have earned the right to be a "Telephone Pioneer." About 97 per cent of those eligible are members.

The purpose of "Pioneering" is to promote continuing fellowship and mutual helpfulness, to carry on the ideals and traditions of the industry, and to provide activities for the enjoyment and well being of the members. This is done through affairs which are short on formality and long on sociability and companionship. Particular attention is given to develop opportunities to serve their fellow members who are in retirement or sick.

The Association membership is divided into 12 Sections in the United States and Canada covering 62 Chapters which include 301 Councils and 350 Clubs. The local Chapter "Vail" contains 17 Councils and over 13,500 members. Mr. Hall will act as liaison for Section 5 which includes the Vail, Hawthorne, Hoosier State (Indiana) and Wisconsin Chapters covering over 28,000 members.

Cleo F. Craig, member of the Board of Directors, A.T. & T. Co., will serve as president of the Association for a year.

* * *

Dr. Leonid V. Azaroff has been appointed associate professor of metallurgical engineering at Illinois Institute of Technology, Chicago, effective Sept. 1.

Azaroff has been on the staff of Armour Research Foundation, an Illinois Tech affiliate, since 1953. He currently is a senior scientist.

He also has been an Illinois Tech evening instructor for three years. He will be in charge of physics of metals and X-ray diffraction teaching and research at the Institute.

Awarded a bachelor's degree cum laude from Tufts College and a Ph.D. in crystallography from Massachusetts Institute of Technology in 1954, he was a teaching assistant and a research associate at MIT.

He was engaged in infra-red research while serving in the U. S. Army from 1944 to 1946.

Azaroff collaborated with M. J. Buerger, professor of crystallography at MIT, to produce the book *The Powder Method in X-Ray Crystallography*, which will be published in January, 1958. He also is author of numerous articles in his field.

* * *

A Chicago physicist attended the International Conference on Ionization Phenomena in Gases, June 11-15, in Venice, Italy.

Dr. Leonard Reiffel, manager of the physics research department at Armour Research Foundation of Illinois Institute of Technology, was invited to attend the meeting being organized by the Italian Society of Physics.

The conference dealt with electrical discharges, and a number of papers were presented on thermonuclear reactions and fusion power, including several by Russian scientists.

Reiffel was one of approximately 12 American scientists who attended the conference.

* * *

The appointment of Dr. James R. Gilbreath as assistant director of Argonne National Laboratory has been announced by Dr. Norman Hilberry, Laboratory director.

Dr. Gilbreath will have staff responsibilities to the laboratory director in the administration of the Laboratory's research and development program.

Dr. Gilbreath formerly was an executive assistant to Dr. Hilberry. He also had served as associate director of the Laboratory's Chemistry Division.

* * *

Col. Alfred W. Sikes, a member of the Western Society for over 25 years, has been awarded honorary membership in The Construction Specifications Institute, and was presented with an engraved certificate at the Institute's First Annual Convention, held in Washington, D.C., on May 13, for his work in founding the Chicago Chapter-CSI and furthering the aims of the Institute nationally.

Col. Sikes has been a member of the Chemical and Metallurgical Section, WSE, since joining the Society, and served as chairman of the Section in 1940.

He is a graduate of the University of Illinois (1926) in chemical engineering. He was awarded his master's degree in metallurgical engineering by Carnegie Institute of Technology (1928), where he was a research fellow in metallurgy in the co-operature program with the Pittsburgh Station of the U. S. Bureau of Mines.

In his present work Col. Sikes is specification engineer with the Chicago Park District, responsible for specifications and contract documents on general construction projects. He has had many years of experience in the field of engineering and construction materials, both public and private.

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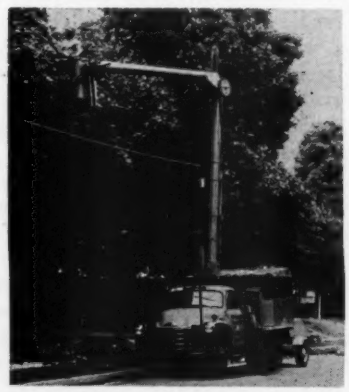

Seek to Quiet Electric Equipment

With more and more electrical and mechanical products being used in and around the home, the American buying public is increasingly aware of the unpleasing noise which can be caused by products with which they come in daily contact.

During the past two years, significant steps in noise control have been taken by many industries, notably those manufacturing such products as home appliances, office and transportation equipment.

In instituting programs of noise evaluation and control, industry turned to acoustical consultants and manufacturers of electronic noise measuring and recording equipment for the tools and know-how to lick their problems.

Most companies begin by using a "jury" of average customers to determine noise levels which are unpleasing. Then, with specially designed electronic noise measuring and recording equipment, they identify the basic sources contributing to the noise by their characteristic frequency, and steps are taken, through product redesign or modification, to eliminate the problem.

Big strides have been made in noise control by manufacturers of air conditioning units, where any noise is liable to be offensive, particularly in bedrooms during sleeping hours.

To meet this problem, one major producer of air conditioning units, Carrier Corporation, has set up an excellent program of noise evaluation and control.

Room air conditioners are given noise level tests in a specially constructed soundproofed room through which assembly lines are routed. A microphone installed over the unit transmits noise level to the electronic measuring and recording equipment.

Key unit in the detection and measurement of noise levels is a Brush Electronics Company Third Octave Pectrum Analyzer and Graphic Level Recorder. With this equipment, Carrier Corporation checks, in less than 50 seconds, 24 points throughout the eight octaves of sound which might be heard by the human ear. The complete noise measurement is automatically plotted on a preprinted chart. To pass the test, measurement records must agree with the master specimen.

According to William C. Egan, Carrier's room air conditioner department manager, "our company originally initiated this program because we wanted to be able to isolate each 'ping' evident in our then latest model. With such information, we were able to remove them by changes in design before going into mass production."

New Manufacturing Methods are Needed

The aircraft industry on June 11 got a preview of the revolution in manufacturing methods that will be required to construct airplanes capable of breaking the "thermal barrier." Speakers at a meeting of The American Society of Mechanical Engineers in San Francisco predicted that tomorrow's aircraft, flying so fast that friction with the air will heat them to temperatures of 1200 degrees Fahrenheit or higher, will have to be made by "completely new manufacturing methods" out of materials only now being developed.

E. A. Simkovich of the Republic Aviation Corporation said that the change in engineering and manufacturing concepts will be similar in scope to changes that came with the introduction of all-metal aircraft in the early 1930's to replace wood and fabric construction.

The basic cause of the impending technological revolution is the fact that, even in rarefied atmosphere seven miles above the earth, high-speed aircraft generate tremendous heat through friction with the air. At this altitude, a plane traveling at "Mach 3," (three times the speed of sound) is heated to about 700 degrees Fahrenheit. At Mach 4, the temperature hits 1200 degrees and at Mach 5, it exceeds 1800 degrees. Present-day aircraft, made largely of aluminum could not operate at such temperatures.

To overcome this problem, new alloys of titanium and steel are now being developed which are relatively immune to heat and are fairly light in weight. Use of such materials, however, will require new manufacturing methods, since the new alloys are much more difficult to shape into usable forms than today's metals.

H. B. Sipple and G. G. Wald of the Lockheed Aircraft Corporation pointed out that although tomorrow's airplanes may be made largely of these super alloys there will also be a need for heat resistant transparent plastics, paints, lubricants, insulators and other non-metallic materials. They added that the development of essential new materials and ways to use them will depend on the "continued support of government-sponsored research and the ingenuity of free enterprise in this country".

In addition to mechanical construction, the engineers are considering the problem of protecting pilots from the intense heat of "thermal" aircraft.

Bank Installs Doors Of 'Stream of Air'

A bank in New York City has installed a doorless door, reports *Industrial Distribution*. The "door" is a stream of air, hot in Winter, cold in Summer, and flows downward from a ceiling vent to a floor grate, keeping bank temperatures unaffected by outside climate that ordinarily seeps past conventional doors opening and closing. The bank has to close rather more substantial doors at night.

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WSE Applications

In accordance with Article I, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the Midwest Engineer:

K. Bob Masamitsu, Mech. Engr., R. E. Hattis Engineers, Inc., 223 W. Jackson Blvd.

Burton A. Scheidt, Engr. in Charge West Side Plant, Metropolitan Sanitary Dist. of Greater Chicago, mail: 1700 W. 91st Pl.

Alfred Watson, Dist. Mgr., Hagan Chemicals & Controls, Inc., mail: 211 S. Main St., Lombard, Ill.

Max L. Beezy, Design Engr., Barnes & Reinecke, Inc., 813 E. Indian St., Midland, Mich.

Geo. C. Hester, Jr., Research Engr., The Association of Western Railways, R-280, Union Station Bldg.

Verne J. Hodson, Constr'n. Engr., Advance Mortgage Co., mail: 110 S. Pine, Mt. Prospect, Ill.

Joseph P. Jallits, Staff Engr., Automatic Electric Co., mail: 1632 N. 78th Av., Elmwood Park, Ill.

Joseph G. Nigro, Dir. of Engrg., Utility Survey Corporations, mail: 2952 Court St., Oceanside, L.I., N. Y.

William A. Thiel, Supt. Const. & Mtce., American Bridge Div., U. S. Steel Corp., 225 Chase St., Gary, Ind.

Orville M. Bercaw, Jr., Sales Engr., O. M. Bercaw & Associates, 333 N. Michigan Av.

Nick Trbovich, Mech. & Elect. Engr., Inland Steel Co., mail: 4225 Ivy St., East Chicago, Ind.

Robert J. Black, Systems Engr., Automatic Electric Co., mail: 9010 Mason, Morton Grove, Ill.

Louis S. Jacobs, President, Louis S. Jacobs & Associates, 2605 W. Pratt Blvd.

Nicholas Raimondi, Chief Engr., National Survey Service, Inc., 134 N. LaSalle St.

Daniel Johnson, Jr., Engr., Illinois Bell Telephone Co., 208 W. Washington St.

John W. Bartley, 1230 - 14th St., Bettendorf, Ia., — attending Univ. of Ill.

Juris Bluris, 1115 W. Illinois St., Urbana, Ill. — attending Univ. of Ill.

John T. Cartland, 1207 W. Columbia, Champaign, Ill., — attending Univ. of Ill.

Frank G. Cuccio, 3644 N. Magnolia Av., — attending Univ. of Ill.

Donald Lindholm, 311 E. Green St., Champaign, Ill., — attending Univ. of Ill.

Gary E. Rittenhouse, 311 E. Green St., Champaign, Ill., attending Univ. of Ill.

Robert Storkman, 1403 - 6th St., Peru, Ill., — attending Univ. of Ill.

Harold E. Groble, Pres. & Gen. Mgr., S. T. Johnson Burner Service, Inc., 2554 Lawrence Av.

George W. Hooper, 913 W. Church St., Champaign, Ill., — attending Univ. of Ill.

Albert A. Uzis (Rein.), Member of Engrg. Staff, I. H. B. RR. and C. R. & I. RR., Gibson, (Hammond), Ind.

John G. Butterworth, Mech. Engr.; Skidmore, Owings & Merrill, 100 W. Monroe St.

Joseph E. Dietzgen, President, Eugene Dietzgen Co., 2421 N. Sheffield.

C. F. MacNish, Assist. Ch., Engrg. Div.; Corps of Engineers, North Central Div., mail: 709 MacLean Av., Kenilworth, Ill.

Manuel J. DeLerno, Application Engr., Del Equipment Co., 162 N. State.

William D. Gabbard, 405 N. Elm, Champaign, Ill., — attending Univ. of Ill.

Thomas H. Gabbard, 405 N. Elm, Champaign, Ill., — attending Univ. of Ill.

Paul J. Zutz, 209 E. Healey, Champaign, Ill., — attending Univ. of Ill.

Frank W. Raymond, Engrg. Practices Engr., Illinois Bell Telephone Co.. mail: 347 N. Lafayette, Griffith, Ind.

Joseph K. Aiu, Struct'l. Detailer, American Bridge Div., U. S. Steel Corp., Gary, Ind.

J. Bart Conn, Engineer, International Harvester Co., mail: 118 Fellows St., Elmhurst, Ill.

Richard G. Petricek, Design Engr., Vern E. Alden Co., 33 N. LaSalle St.

Lacy W. Seawell, Office Engr., Clark Construction Co., mail: 9760 - 58th St., LaGrange, Ill.

Frederick C. Smith, (Rein.), Engr.-Mgr., RR Dept., Marsh & McLennan, Inc., 231 S. LaSalle St.

James T. Considine, Sales Supervisor, Minneapolis-Honeywell Co., 7350 Lincoln Av.

Richard L. Foss, Associate; Consoer, Townsend & Associates, 360 E. Grand Av.

Jerry Jedd, Chief Proj. Engr., Production Instrument Div. of General Control, 710 W. Jackson Blvd.

A. B. Segur, A. B. Segur & Company, 1185 S. Ridgeland Av., Oak Park, Ill.

Herbert Philander, Engineer, Illinois Clay Products Co., mail: 1422 Marcus Ct., East, Park Ridge, Ill.

Peter Christy, 1600 N. Market St., Champaign, Ill. - attending University of Illinois.

Eugene D. Singer, 311 E. Green St., Champaign, - attending University of Illinois

James B. Maher, Design Engineer, Chicago Bridge & Iron Co., mail: 10208 Walden Pkwy.

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W. E. Ploeger, Export Dist. Mgr., Automatic Electric International; mail: 830 Mulford St., Evanston, Ill.

C. B. Monk, Jr., Mgr. of Arch. & Eng. Res'h., Structural Clay Research, Geneva, Ill.

R. R. Quinn, District Manager, Chemical Engineering Progress, 612 N. Michigan Av.

Ringold Olivier, Plant Engr., American Bridge Div., U. S. Steel Corp., Gary, Ind.

C. Bennett Stephens, Indust'l. Engrg. Trainee, Sangamo Electric Co., Springfield, Ill.

Sidney Mayster (Rein.), Dept. Head-Staff Engr. Dept., Sargent and Lundy, 140 S. Dearborn St.

Warren A. Baxter, Mgr. Inst'n. & Serv. Eng.-Elect., General Electric Co., 840 S. Canal St.

Harlen D. Shellabarger, Assist. Chief Engineer, Wilson Athletic Goods Mfg. Co., Inc., 2037 N. Campbell Av.

William C. Kellow, attending Northwestern University, 337 Flora Pl., Highland Park, Ill.

Arthur S. Salkin, Civil Engineer IV, Bureau of Sewers, City Hall.

Arnold Sobel, Vice President, Material Service Corp., 300 W. Washington St.

Richard E. Stack, Plant Engineer, National Malleable & Steel Castings Co., 1400 S. Laramie Av., Cicero, Ill.

Werner Gutberlet, Designer-Engineer, Goodman Manufacturing Co., 4800 S. Halsted St.

Anthony Carmen, Director of Prod'n., The Logan-Long Co., 6600 S. Central Av.

C. C. Van Denburgh, Staff Adm. Engineer, Commonwealth Edison Co., 72 W. Adams St.

Milton Pikarsky, Partner; Plumb, Tuckett & Pikarsky, 25 E. Jackson Blvd.

Frank J. O'Donnell, Engr. of Assignments & Mtce., City of Chicago, Bureau of Sewers, City Hall.

Andrew R. Kinder, Superv'g. Eng. & Res. Engr., Chicago Dept. Public Works, 320 N. Clark St.

Index of MIDWEST ENGINEER *Advertisers*

Vern E. Alden 22
Aldis & Company 15
Alvord, Burdick & Howson 22
Asbestos & Magnesia Materials Co. 30
Asplundh Tree Experts 28
Warren Barr Supply Co. 6
Battey & Childs 22
Bell Lumber & Pole Co. 32
Gus Berthold Electric Co. 21
Building Contractors Employment Association 19
John Burns Construction Co. 10
Silas Cartland 23
Chas. W. Cole & Son 22
Combustion Engineering .....Cover II
Commonwealth Edison Co. ..Cover IV
Contracting & Material Co. 16
Davey Tree Expert Co. 7
DeLeuw, Cather & Co. 23
Federal Pipe & Supply Co. 20
Walter H. Flood 23
Gilbert-Hodgman, Inc. 27
Greeley & Hansen 22
E. R. Gritschke & Associates, Inc. ..23
The Haines Co. 15
Hazelet & Erdal 22
Robert W. Hunt Co. 23
Jenkins Merchant & Nankivil 23
Josam Mfg. Co. 12
Lester B. Knight 22
F. J. Kornacker & Associates 22
A. A. Lipsey & Associates 22
W. H. Lyman Construction Co. 18
Midwest Contractors, Inc. 9
Midwest Forestry Corp. 31
Mississippi Valley Steel 21
Muncie Construction Co. 11
Murray Brothers 17
Nash Brothers Construction Co. 11
Fred Nelson of Dayton, Ohio 29
New Products Corp. 4
John F. Palmer 22
Sargent & Lundy 23
Wm. E. Schweitzer & Co. 25
Soiltest, Inc. 5
Soil Testing Services 23
Stanley Engineering Co. 22
Valentine Clark Corp. 13
L. L. Weldy & Associates 10
Westinghouse 9

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'Operation Heartbeat'

The kin of Moby Dick were reluctant subjects on a recent "Operation Heartbeat" expedition that gathered data for use in medical and electronic research.

Nine California Gray Whales were successfully stuck with harpoons attached to a 49-strand specially made stainless steel cable.

Over this cable, made by Sevenstrand Tackle Company, using Allegheny Ludlum Steel Corporation's stainless steel, whale heartbeats were taken.

The project was under the direction of the famed Boston heart specialist, Dr. Paul Dudley White, who hoped to gain further basic understanding of human heart action by studying animal pulse rates.

The scene of the unsual experiment was in a bay, which the whales use as a mating and calving site, 450-miles south of San Diego.

The harpoons had electronic pick-ups The heartbeat impulses were directed to floating shortwave transmitters, which in turn sent the signals to shore and ship based receivers. The delicate impulses were transcribed onto cardiograph tape for later study.

Obituaries

The Western Society of Engineers has recently been notified of the following deaths:

Western Society learned of the passing of Roy M. Henderson on June 27, 1957. Mr. Henderson, a Life Member of the Society, had been associated for many years with United States Engineers and Constructors, Inc.

Upon his retirement, Mr. Henderson had made his home in Clearwater Florida. Sincerest condolences are expressed on behalf of the membership to his widow and family. Mr. Henderson was 78.

* * *

Vernon R. Kneer, Engineer for the firm of Alvord, Burdick & Howson, and a Member of the Western Society died on May 31, 1957.

Mr. Kneer had been active for many years in promoting the interests of the engineering profession through his membership in Western Society. His loss is felt equally by the engineering profession and the membership of the Society. Western Society of Engineers, on behalf of its membership, wishes to extend its deepest sympathy to the Kneer family.

* * *

On June 14, 1957, Life-Member Alfred Herz passed away. For many years, Mr. Herz had served as an Engineer of Tests and a Consultant for the Public Service Company of Northern Illinois. He held patents on some 40 devices, including a black tube for television.

Because of his past associations within the Western Society, and because of his support for its aims, Mr. Herz's memory will be cherished by his many friends in the Society. Sincerest condolences are offered to his widow.

* * *

Charles W. PenDell, Life-Member of the Western Society of Engineers passed away on April 19, 1957. Mr. PenDell was Treasurer of the Electrical Engineers Equipment Company.

During his more than 30 years of membership in the Society, Mr. PenDell consistantly exhibited interest in furthering the Western Society's prestige and expanding its growth. His loss will be keenly felt by his many friends in the Western Society.

It was with deep regret that his many friends at Western Society were informed of the passing of William G. Arn, Life-member. Mr. Arn, for many years an active participant in the affairs of the Society, was in addition a Special Engineer with the Illinois Central Railroad.

Mr. Arn was a Trustee of the Western Society of Engineers from 1934-36. He was also actively engaged in the work of various sections, particularly the Membership and Program Committees and the Transportation Section. Mr. Arn died on May 8, 1957.

* * *

Western Society of Engineers membership was saddened to learn of the death of Member Glenn I. Kientz on May 28, 1957. Mr. Kientz, District Manager of the H. G. Vogel Company, had associated himself consistently with affairs aimed at the furtherance of the Society and its policies.

The entire membership of the Western Society joins in expressing its deepest sympathy to the Kientz family.

* * *

Life-Member William A. Hazard died on May 19, 1957. Previous to his retirement, Mr. Hazard was Superintendent of Erection with the Bethlehem Steel Company of Bethlehem, Pennsylvania. His contributions to the progress of the steel industry were immeasurable.

Within the Western Society, Mr. Hazard held the distinction of being one of our more venerable members, having held membership for over a half century.

* * *

Daniel E. Garey, Member of Western Society of Engineers, passed away on January 27, 1957. Mr. Garey, Chief Structural Engineer for the firm of Graham, Anderson, Probst & White, was well known for his work in the field of building design.

His many friends in Western Society will be saddened to learn of his death and the Society, on behalf of its entire membership, extends its deepest sympathies to the Garey family.

Ceramic Tile Firm Contracts Designers

The greatest collection of designing talent ever assembled in the ceramic industry has been gathered by Pomona Tile Manufacturing Company for its new "Distinguished Designer Series" of decorative wall tiles.

Five of the outstanding designers in the United States have been put under contract by Pomona to produce new ceramic tile patterns for the series.

The five include Saul Bass, Paul Laszlo, Dorothy Liebes, Paul McCobb, and Millard Sheets. Bass is active in industrial design-planning and also is well known for his designs of motion picture art titles. Laszlo is noted as an industrial designer and interior designer. Dorothy Liebes has won numerous awards for her art in textile designs. McCobb is best known as the originator of the "Linear Look" in contemporary furniture. Sheets is one of America's top watercolor artists.

Pomona's new decorative tiles created by the artists will be introduced one each month beginning in July.

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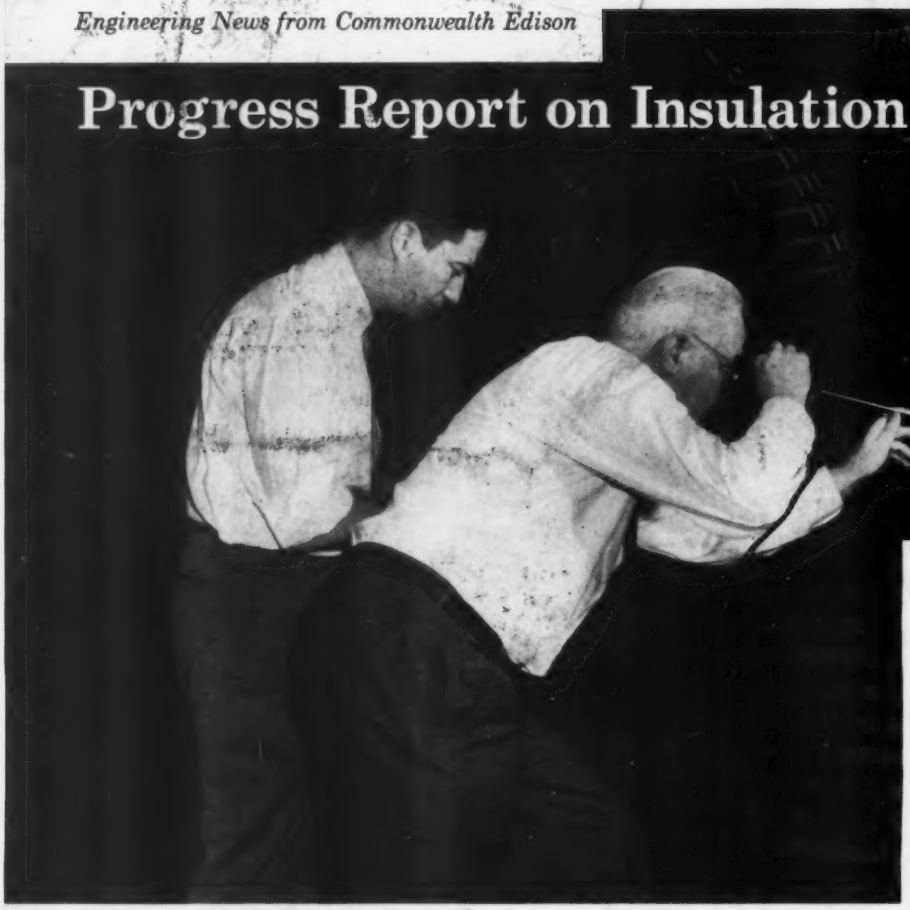
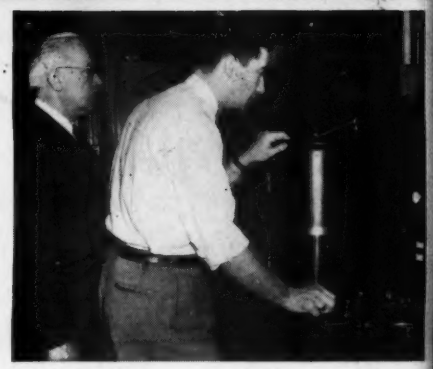


Senior Engineer Ernst Schmitt inspects the condition of the insulation of a generator stator winding. Engineer Michael Cosgrove takes notes.



Measuring the power factor (an index of the quality of insulation) of a sample of transformer oil.

Edison engineers are quick to recognize better materials and new method

Just how important is insulation? It is this important. Without it the electric power industry just would not exist.

Every electrical device—from a light bulb to a giant 300,000 kw generator—depends on the availability of good insulating materials.

Increasing loads call for right kind of insulation

Probably more important than any other single factor in determining conditions under which electrical equipment may be operated is the quality and kind of insulation, as well as the way it's applied. With the higher voltages and heavier loadings required these days, better insulating materials and improved methods of application are needed. No wonder our engineers give such close attention to insulation.

New insulating materials continually being sought

Edison engineers are constantly studying the possibilities of applying the new developments in insulating materials—not only to meet the demands of higher voltages made necessary by increased loads, but also to maintain the reliability of the Edison system.

Quality of existing insulation checked periodically

Just as important as new developments, is the quality of the existing line and equipment insulation. Our engineers periodically check insulation quality, assess its condition, and determine its remaining useful life. They must be able to answer such questions as: "Is the insulation serviceable?" "What is its probable life?" "Should it be reconditioned or replaced now or shall we wait another year?"

Such decisions require a high degree of skill and experience. Thus, in insulation evaluation, engineering judgment insures top performance at minimum cost.

High quality of service depends on good insulation. They're inseparable partners. And, we at Commonwealth Edison are quick to make friends with new materials and methods which show promise, and which will help maintain low cost of electricity and high standards of service.

Pioneers in Progress for over 70 years

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AND
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